WHAT IS CLAIMED IS:

1. A vehicle motion model generating device for generating a vehicle motion model that represents a motion state of a vehicle, comprising:

a first recurrent neural network formed by connecting plural nodes so that an output of a node is input to another node in accordance with a predetermined coupling weight coefficient, comprising a loop feeding back an output of at least one node to at least one of said one node and a node other than said one node; and

an optimizing unit for determining an optimum solution of said coupling weight coefficient in said first recurrent neural network based on a learning rule using a hereditary algorithm, wherein

said first recurrent neural network outputs a first parameter indicating said motion state of the vehicle based on predetermined input information, thereby functioning as said vehicle motion model.

2. The vehicle motion model generating device according to claim 1, wherein said first recurrent neural network has a hierarchical structure comprising at least an input layer formed of one or more nodes and an output layer formed of one or more nodes, and said optimizing unit determines said optimum solution of said coupling weight coefficient with connection of

respective nodes between neighboring layers being set as a processing target.

3. The vehicle motion model generating device according to claim 1, wherein said first recurrent neural network is formed of said plural nodes connected mutually so that said output of said one node is input to all the plural nodes including said one node, and respective outputs of said plural nodes are input to said one node, and said optimizing unit determines said optimum solution of said coupling weight coefficient with mutual connection of said plural nodes being set as a processing target.

4. The vehicle motion model generating device according to claim 1, wherein each of said plural nodes uses one of a sigmoid function and a non-sigmoid function other than said sigmoid function as a transfer function.

5. The vehicle motion model generating device according to claim 1, further comprising a second recurrent neural network constructed as a network different from said first recurrent neural network, functioning as the vehicle motion model by outputting a second parameter indicating a motion state of the vehicle different from said first parameter, wherein

said optimizing unit further determines the optimum

solution of said coupling weight coefficient in said second neural network based on said learning rule using said hereditary algorithm.

6. The vehicle motion model generating device according to claim 2, wherein each of said plural nodes uses one of a sigmoid function and a non-sigmoid function other than said sigmoid function as a transfer function.

7. The vehicle motion model generating device according to claim 2, further comprising a second recurrent neural network constructed as a network different from said first recurrent neural network, functioning as the vehicle motion model by outputting a second parameter indicating a motion state of the vehicle different from said first parameter, wherein

said optimizing unit further determines the optimum solution of said coupling weight coefficient in said second neural network based on said learning rule using said hereditary algorithm.

8. The vehicle motion model generating device according to claim 3, wherein each of said plural nodes uses one of a sigmoid function and a non-sigmoid function other than said sigmoid function as a transfer function.

9. The vehicle motion model generating device according to

claim 3, further comprising a second recurrent neural network constructed as a network different from said first recurrent neural network, functioning as the vehicle motion model by outputting a second parameter indicating a motion state of the vehicle different from said first parameter, wherein

said optimizing unit further determines the optimum solution of said coupling weight coefficient in said second neural network based on said learning rule using said hereditary algorithm.

10. The vehicle motion model generating device according to claim 5, wherein said first recurrent neural network and said second recurrent neural network are mutually connected to each other so that a state variable having a correlation with said first parameter output from said first recurrent neural network is input to said second neural network, where said state variable represents one of a road surface state and a motion state of the vehicle.

11. A road surface friction coefficient estimating device for estimating a road surface friction coefficient based on a vehicle motion model that represents a motion state of a vehicle and is generated by a vehicle motion model generating device, wherein

said vehicle motion model generating device comprises a first recurrent neural network formed by connecting plural

nodes so that an output of a node is input to another node in accordance with a predetermined coupling weight coefficient, comprising a loop feeding back an output of at least one node to at least one of said one node and a node other than said one node, and an optimizing unit for determining an optimum solution of said coupling weight coefficient in said first recurrent neural network based on a learning rule using a hereditary algorithm, wherein said first recurrent neural network outputs a first parameter indicating said motion state of the vehicle based on predetermined input information, thereby functioning as said vehicle motion model.

12. A vehicle behavior estimating device for estimating a behavior of a vehicle based on a vehicle motion model that represents a motion state of a vehicle and is generated by a vehicle motion model generating device, wherein

said vehicle motion model generating device comprises a first recurrent neural network formed by connecting plural nodes so that an output of a node is input to another node in accordance with a predetermined coupling weight coefficient, comprising a loop feeding back an output of at least one node to at least one of said one node and a node other than said one node, and an optimizing unit for determining an optimum solution of said coupling weight coefficient in said first recurrent neural network based on a learning rule using a

hereditary algorithm, wherein said first recurrent neural network outputs a first parameter indicating said motion state of the vehicle based on predetermined input information, thereby functioning as said vehicle motion model.

13. A method for generating a vehicle motion model that represents a motion state of a vehicle, wherein a first recurrent neural network is formed by connecting plural nodes so that an output of a node is input to another node in accordance with a predetermined coupling weight coefficient and includes a loop feeding back an output of at least one node to at least one of said one node and a node other than said one node, said method being executed by a computer, comprising the steps of:

determining an optimum solution of a genetic type based on a learning rule using a hereditary algorithm while setting said coupling weight coefficient in said first recurrent neural network as said genetic type; and

outputting an optimum solution of said coupling weight coefficient to said first recurrent neural network based on said optimum solution of said genetic type, wherein

said first recurrent neural network outputs a parameter indicating said motion state of the vehicle based on predetermined input information, thereby functioning as said vehicle motion model.

14. The method according to claim 13, wherein said first recurrent neural network has a hierarchical structure including at least an input layer formed of one or more nodes and an output layer formed of one or more nodes, comprising the step of determining said optimum solution of said genetic type while connection of respective nodes between neighboring layers is set as a processing target.

15. The method according to claim 13, wherein said first recurrent neural network is formed of said plural nodes connected mutually so that said output of said one node is input to all the plural nodes including said one node, and respective outputs of said plural nodes are input to said one node, comprising the step of determining said optimum solution of said coupling weight coefficient while mutual connection of respective nodes is set as a processing target.

16. The method according to claim 13, wherein a second recurrent neural network is constructed as a network different from said first recurrent neural network, and functions as the vehicle motion model by outputting a second parameter indicating a motion state of the vehicle different from said first parameter, further comprising the steps of determining the optimum solution of the genetic type while setting the coupling weight coefficient in said second recurrent neural network as said genetic type,

and outputting said optimum solution of said coupling weight coefficient to said second recurrent neural network based on said optimum solution of said genetic type.

17. The method according to claim 14, wherein a second recurrent neural network is constructed as a network different from said first recurrent neural network, and functions as the vehicle motion model by outputting a second parameter indicating a motion state of the vehicle different from said first parameter, further comprising the steps of determining the optimum solution of the genetic type while setting the coupling weight coefficient in said second recurrent neural network as said genetic type, and outputting said optimum solution of said coupling weight coefficient to said second recurrent neural network based on said optimum solution of said genetic type.

18. The method according to claim 15, wherein a second recurrent neural network is constructed as a network different from said first recurrent neural network, and functions as the vehicle motion model by outputting a second parameter indicating a motion state of the vehicle different from said first parameter, further comprising the steps of determining the optimum solution of the genetic type while setting the coupling weight coefficient in said second recurrent neural network as said genetic type, and outputting said optimum solution of said coupling weight

coefficient to said second recurrent neural network based on said optimum solution of said genetic type.

19. The method according to claim 16, wherein said first recurrent neural network and said second recurrent neural network are mutually connected to each other so that a state variable having a correlation with said first parameter output from said first recurrent neural network is input to said second neural network, where said state variable represents a road surface state or a motion state of the vehicle.